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(54) Title: METHOD AND SYSTEM FOR NOTIFYING MOBILE SUBSCRIBERS OF UNSUPPORTED SERVICE FEATURES BY A
CELLULAR TELECOMMUNICATION NETWORK

(57) Abstract

The present invention sets forth a technique for notifying subscribers operating on a visiting cellular telecommunication network of service features not supported by said networks. The invention is particularly useful for warning roaming subscribers unfamiliar with the availability of supported service features such as abbreviated dialling for international access codes, also known as Plus Code dialling. In an embodiment of the invention, the roaming terminal reads the broadcast information on control channel of the visiting network. The broadcast information contains a Service Menu Message that includes a plurality of Information Elements (IE) that characterizes the service features supported by the network, including Plus Code dialling. If the Plus Code Dialling is not supported, and the subscriber attempts to use the service feature by entering, e.g., the "+" key in the digit string, a predetermined notification message is immediately displayed on the terminal indicating that the feature is not supported.

INFORMATION ELEMENT (IE)	PV	TYPE	LENGTH
PROTOCOL DISCRIMINATOR		N	2
MESSAGE TYPE		N	6
VOICE PRIVACY MODE MAP		N	4
DATA PRIVACY MODE MAP		N	4
VOICE CODER MAP		N	6
MESSAGE ENCRYPTION ALGORITHM MAP		N	8-40
MESSAGE ENCRYPTION KEY MAP		N	4
MENU MAP		N	10
FACCH/SACCH ARO MAP		N	1
USER GROUP MAP		N	1
SMS MAP		N	2
IRA SUPPORT		N	1
GATS SUPPORT	TIA/EIA 136-A, PV0	N	1
ISO-8859-1 (LATIN 1) SUPPORT	TIA/EIA 136-A, PVI	N	1
ISO-10646 (UNP) SUPPORT	TIA/EIA 136-A, PVI	N	1
ISO-8859-8 (LATIN/HEBREW) SUPPORT	TIA/EIA 136-A, PVI	N	1
ASYNC DATA SUPPORT	TIA/EIA 136-A, PVI	N	1
G3-FAX SUPPORT	TIA/EIA 136-A, PVI	N	1
DADS SUPPORT	TIA/EIA 136-A, PVI	N	1
SMS BROADCAST SUPPORT	TIA/EIA 136-A, PV2	N	1
ADDRESS INFORMATION MAP	TIA/EIA 136-A, PV2	N	10

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Method And System For Notifying Mobile Subscribers of Unsupported Service Features By a Cellular Telecommunication Network

5

FIELD OF THE INVENTION

The present invention relates generally to cellular telecommunication networks, more specifically, the invention relates to a method and system for providing feedback to users on service feature support in unfamiliar cellular telecommunication networks.

10

BACKGROUND OF THE INVENTION

Many manufacturers of cellular telecommunication equipment often market equipment to network operators in the form of a core package which enables the operator to provide basic cellular service to its subscribers. In addition, value-added features may be included in the package, by request of the operator, to provide numerous enhanced services that may be popular with subscribers. Operators have often been inclined to include various value-added features as a way of differentiating themselves from competitors. As a result, these marketing techniques, used to lure new subscribers, often leads to an environment whereby popular features eventually become standard such as caller ID and voicemail, for example.

Another example of a value-added feature useful to mobile users is abbreviated dialling service, and one form of which is international access code dialling. This feature is particularly useful to subscribers that roam internationally since it eliminates the need for subscribers to know the international code access codes that apply to each serving

area or country encountered. The international access code, when followed by the dialled number, indicates to the serving cellular network that the dialled number is an international call and should be routed accordingly. International access codes typically vary by region or country and, for roaming subscribers, are often inconvenient to recall in the event that they need to make an international call. By way of illustration, a caller in North America desiring to making an international call must dial 011 (international access code) which is typically followed by the country code, city code (or network code if calling a cellular number), and finally the telephone number. Table A depicts some international access codes (IAC) necessary for placing international calls for some exemplary countries.

COUNTRY	IAC
SWEDEN	009
N. AMERICA	011
NORWAY	095
FINLAND	990

TABLE A

A solution for making international calls easier to place while roaming currently exists for networks operating in accordance with the Global System for Mobile Communications (GSM) wireless standard (although there are ongoing standardization efforts for implementation in other wireless standards such as IS-136). The GSM standard, initially introduced as a pan-European digital standard, was designed from its inception to expedite international roaming between CEPT (Conference Europeenne des Postes et Telecommunications) countries. The GSM solution, also referred to as Plus Code Dialling, permits the caller to perform abbreviated dialling by entering a specific symbol ("+" key on the mobile terminal) in place of the international access code followed by the rest of the digit string. The mobile terminal translates the "+" symbol

and defines the digit string as an "international" call. When transmitting the digit string to the network, the mobile terminal deletes the "+" symbol from the string and transmits the string to the network while indicating it is an international call. In the serving network mobile switching center (MSC), the string is identified as "international" wherein the indication is translated into the appropriate international access code which is added to the digit string and routed accordingly.

One difficulty faced by roaming subscribers using this solution is the inconsistency in deployment in support of Plus Code Dialling. This is because the feature is optional and one that network operators may choose not to support. Thus an unsuspecting subscriber may roam into a network that does not support the feature. In this situation, it would be desirable for subscribers to receive immediate notification, preferably on the mobile terminal, of the lack of support in the event that the feature is used to make an international call. In addition, the notification techniques, if any, may not be readily employable across different system standards and types of systems. Thus, it is an objective of the present invention to provide a mechanism for alerting subscribers of unsupported features immediately upon attempted use.

SUMMARY OF THE INVENTION

Briefly described, and in accordance with an embodiment thereof, the invention discloses a method and system for notifying a roaming subscriber, operating a mobile terminal on, e.g., a visiting cellular network, of whether an abbreviated dialling service feature, such as Plus Code Dialling, is supported by the network. In an embodiment of the present invention, the method includes monitoring the control channels for broadcast information transmitted on the broadcast control channel. Included on the broadcast control channel is a Service Menu Message containing a plurality of Information Elements that characterize the service features supported by the network. If an "Address Information Map" Information Element is available and supported by the network, the Plus Code Dialling service feature is supported and vice versa. If Plus Code Dialling is

not supported and the subscriber attempts to use the service feature by entering, e.g., the
"+" key in the digit string, a predetermined notification message in the terminal is
immediately displayed indicating that the feature is not supported. The method may
optionally utilize the step notifying the subscriber by using a Reorder/Intercept message
5 sent from the network to the terminal announcing the warning.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with further objects and advantages thereof, may best be
understood by reference to the following description taken in conjunction with the
10 accompanying drawings in which:

FIG. 1 illustrates an exemplary format of the Service Menu Message for use in
accordance with an embodiment of the present invention;

FIG. 2 is an exemplification of an Information Element containing an "Address
Information Map" suitable for use with the embodiment; and

15 FIG. 3 illustrates a flow diagram of an exemplary procedure operating in
accordance the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed toward a mechanism for notifying mobile
20 subscribers that specified features, such as abbreviated international access code dialling
(Plus Code Dialling), are not supported by a serving network. In accordance with an
embodiment of the invention, a cellular network operating in accordance with the
TDMA (Time Division Multiple Access) IS-136 Rev A digital wireless standard as
specified by the Electronic Industries Association and Telecommunications Industry
25 Association (EIA/TIA) is characteristically described. However, those skilled in the art

will recognize that the invention may be applicable to other TDMA based standards such as Global System for Mobile Communication (GSM) and Personal Digital Cellular (PDC), for example. For simplicity, the term mobile terminal will henceforth be referred to simply as the terminal.

5 Internationally roaming subscribers desiring to use the cellular services of a network operator serving a new region can typically do so by simply turning on his/her terminal and undergoing a process referred to as registration. Registration is a process by which the terminal informs the current network of its identification, location and other associated information such that the subscriber's home network can be
10 interrogated to determine if access to the network should be granted. Exemplary factors used in the determination may include the subscriber's credit worthiness and current billing information, for example. Following a positive determination, the IS-136 terminal makes an initial reading, during power up or at reselection, of the Digital Control Channel (DCCH) for broadcast information on the Fast Broadcast Control
15 Channel (F-BCCH). However, any access attempt (including registration) to the system must be preceded by reading at least one full cycle of the F-BCCH. A Service Menu Message that provides a list of services supported by the network specified by a plurality of Information Elements (IE) may be broadcast on either the F-BCCH or the Extended Broadcast Control Channel (E-BCCH) depending, e.g., on the priority the operator
20 places on the information and available bandwidth on the F-BCCH. Furthermore, reading the E-BCCH at this time is also optional and typically up to the terminal manufacturer when to do this.

FIG. 1 illustrates an exemplary format of the Service Menu Message for use in accordance with the embodiment. As familiar to those skilled in the art, the Service
25 Menu contains parameters, indicated by reference numeral 100, for determining features and/or functions operable within the network. The Service Menu contains flags that indicate whether a feature is supported by the network. By way of example, Over-the-Air Activation (OATS) having a value of 1 in the Service Menu indicates support for the function, and a value of 0 indicates no support. Similarly, the SMS (Short Message

Service) map identifies the extent to which the network supports Cellular Messaging Teleservice, for example:

	<u>VALUE</u>	<u>STATUS</u>
	00	Not Supported
5	X1	SMS SUMIT SUPPORTED
	1X	SMS DELIVER SUPPORTED

Furthermore, the terminal is able to determine from the Service Menu Message whether abbreviated dialling service feature such as Plus Code Dialling is supported by reading an Information Element "Address Information Map" 110. This element provides
10 the terminal with information as to whether the network is able to route the call using the "Address Information" IE. If the IE indicates that calls may be routed using data provided by the "Address Information" map, the network translates the, e.g., "+" symbol in the digit string to the appropriate international access code and routes the call accordingly. Conversely, if either the Service Menu indicates that no international
15 numbers are supported through the "Address Information" IE or the information element is simply not provided, then the terminal will indicate to the subscriber that the Plus Code Dialling feature is not supported by the network. The notification occurs when the subscriber, in an attempt to place an international call, enters the "+" key wherein a predetermined warning message is immediately shown on the terminal display
20 indicating that the feature is not operable. In the preferred embodiment, the implementation of the Plus Code feature should be universally supported by the operating standard by submission to a relevant standardization body such as (TIA TR 45.3) as, for example, an addendum to the existing Service Menu Message.

FIG. 2 is a detailed exemplification of an "Address Information" map (for IE 110
25 of FIG. 1) suitable for use with the described embodiment. In addition to the International Access Code information (Plus Code Dialling), the information element shown also identifies various other addressing information that can be supported the network. As an example, the National Number or country code can be mapped into the

Service Menu Message and used for abbreviated dialling such as, e.g., when the subscriber enters a designated key representing a special character such as "*", "/", "# etc. or entering a number code in the digit string. Similarly, when dialling cellular numbers, the network code used for identifying a specific cellular network may be abbreviated along with company phone extensions, for example.

FIG. 3 illustrates a flow diagram of an exemplary procedure operating in accordance with the present invention, for notifying the subscriber when an abbreviated dialling feature such as international access code service (Plus Code Dialling) is not supported by the network. An operating terminal is initially camped on the DCCH, as shown in step 300. The subscriber attempts to place an international call by entering a "+" followed by a digit string, as shown in call origination step 310. In step 320, the terminal makes a determination to identify whether the "Address Information" IE is available by reading the Service Menu Message on the control channel broadcast information. The Service Menu Message may be broadcast on either the F-BCCH or E-BCCH, wherein the broadcast of which decided by the operator.

If the Service Menu Message is broadcast on the F-BCCH and is able to be read and the "Address Information" IE is not available, the subscriber is notified that Plus Code Dialling is not supported immediately upon entering the "+" key in the digit string. If the "Address Information" IE is present, a check is made to determine if the "Address Information" is supported, as shown in step 330. This step occurs because it may be possible for the subscriber to originate a call prior to reading the E-BCCH (when the Service Menu Message is broadcast on the E-BCCH) since the IS-136 specification only requires the terminal to read the F-BCCH prior to performing a call origination. Similarly, if the "Address Information" is not supported, the subscriber is notified, e.g., via the terminal display or recorded audio message, as shown in step 340. If the "Address Information" is supported, the call origination message is sent together with the number "Type", i.e., the number is designated as "international" in which the appropriate international access code is translated and the call is routed accordingly by the MSC, as shown in step 350.

In an additional aspect of the invention, notification of unsupported service features may be sent to the terminal by way of a Reorder/Intercept message with 'Cause' set to "Address Information not supported." As known by those skilled in the art, the Reorder/Intercept procedure is used to inform subscribers of the cause of the failure to carry out an intended action, e.g., dialling a wrong number etc. Upon receipt of the Reorder/Intercept message, the terminal can use the same user interface as previously described to alert the subscriber in the form of a displayed message or audio message, for example. This procedure, unlike the previous technique, requires the use of a traffic channel resource in order to transmit the warning announcement which may not be desirable.

Although the invention has been described in some respects with reference to specified preferred embodiments thereof, variations and modifications will become apparent to those skilled in the art. In particular, the invention is not limited to networks operating in accordance with the IS-136 standard. The inventive concept is applicable to networks having different broadcast information formats wherein the Service Menu Message may be adapted for use with, e.g., the GSM or personal digital cellular (PDC) standard. Moreover, the exemplary Plus Code Dialling method is not restricted to using the "+" key exclusively, since characters such as, e.g., the "*", "/" or a predefined number code may be used to represent the various types of abbreviated dialling supported by the "Address Information" IE. It is therefore, the intention that the following claims not be given a restrictive interpretation but should be viewed to encompass variations and modifications that are derived from the inventive subject matter disclosed.

WHAT IS CLAIMED IS:

1. In a cellular telecommunication network providing mobile communication services to a plurality of subscribers operating mobile terminals on the network, a method of notifying said subscribers attempting to use a service feature not supported by said cellular telecommunication network, comprising the steps of:
 - monitoring a control channel containing broadcast information;
 - determining if the service feature is supported by the network from said broadcast information;
 - detecting said subscriber's attempted use of said service feature; and
 - 10 notifying the subscriber's mobile terminal when said service feature is not supported by the network.
2. A method according to claim 1 wherein the service feature is a form of abbreviated dialling.
3. A method according to claim 1 wherein the broadcast information contains a Service Menu Message comprising a plurality of Information Elements indicating the service features supported by the network.
- 15 4. A method according to claim 3 wherein one of said plurality of Information Elements in the Service Menu Message includes an Address Information Map associated a plurality of abbreviated dialling functions.
- 20 5. A method according to claim 1 wherein a warning message is displayed on the terminal display indicating that the feature is not supported.
6. A method of notifying a roaming subscriber, operating a mobile terminal on a visiting cellular network, of whether an abbreviated dialling service feature is supported by the network comprising the steps of:

monitoring the control channel for broadcast information transmitted thereon;

determining whether service feature is supported by the network from the broadcast information;

detecting when the subscriber attempts to use the service feature; and

5 notifying the subscriber's mobile terminal in response to the attempted use of the service feature when the service feature is not supported by the network.

7. A method according to claim 6 wherein the cellular network operates in accordance with the Time Division Multiple Access (TDMA) IS-136 digital wireless standard.

10 8. A method according to claim 6 wherein the service feature is any one of abbreviated dialling processes of international access, national country code, network code, and extension dialling.

9. A method according to claim 8 wherein the detecting step include the subscriber entering the "+" key on the terminal.

15 10. A method according to claim 6 wherein the Service Menu Message containing an Information Element "Address Information" is broadcast on any one of Fast Broadcast Control Channel (F-BCCH) and Extended Broadcast Control Channel (E-BCCH).

20 11. A method according to claim 6 wherein the notification that the Plus Code Dialling service feature is not supported is displayed on the terminal.

12. A system for notifying a roaming subscriber, operating a mobile terminal on a visiting cellular network, of whether Plus Code Dialling service feature is supported by the network comprising:

a Service Menu Message broadcast over the control channel, wherein the Service Menu Message includes a plurality of Information Elements that characterize the service features supported by the network;

an "Address Information Map" Information Element contained in the Service
5 Menu Message;

means for detecting the whether the Plus Code Dialling service feature is supported by the network; and

means for notifying the mobile terminal in response to its attempted use by the subscriber when the Plus Code Dialling service feature is not operable.

10 13. A system according to claim 12 wherein the "Address Information Map" further includes National Number country code, cellular network code, and abbreviated extension dialling.

14. A system according to claim 12 wherein the Service Menu Message is broadcast over any one of the Fast Broadcast Control Channel (F-BCCH) and Extended Broadcast
15 Control Channel (E-BCCH).

15. A system according to claim 12 wherein the means for alerting the mobile terminal includes displaying a predetermined warning message on the terminal display.

16. A system according to claim 12 wherein the means includes the sending a Reorder/Intercept message from the network to the mobile terminal.

FIG. 1

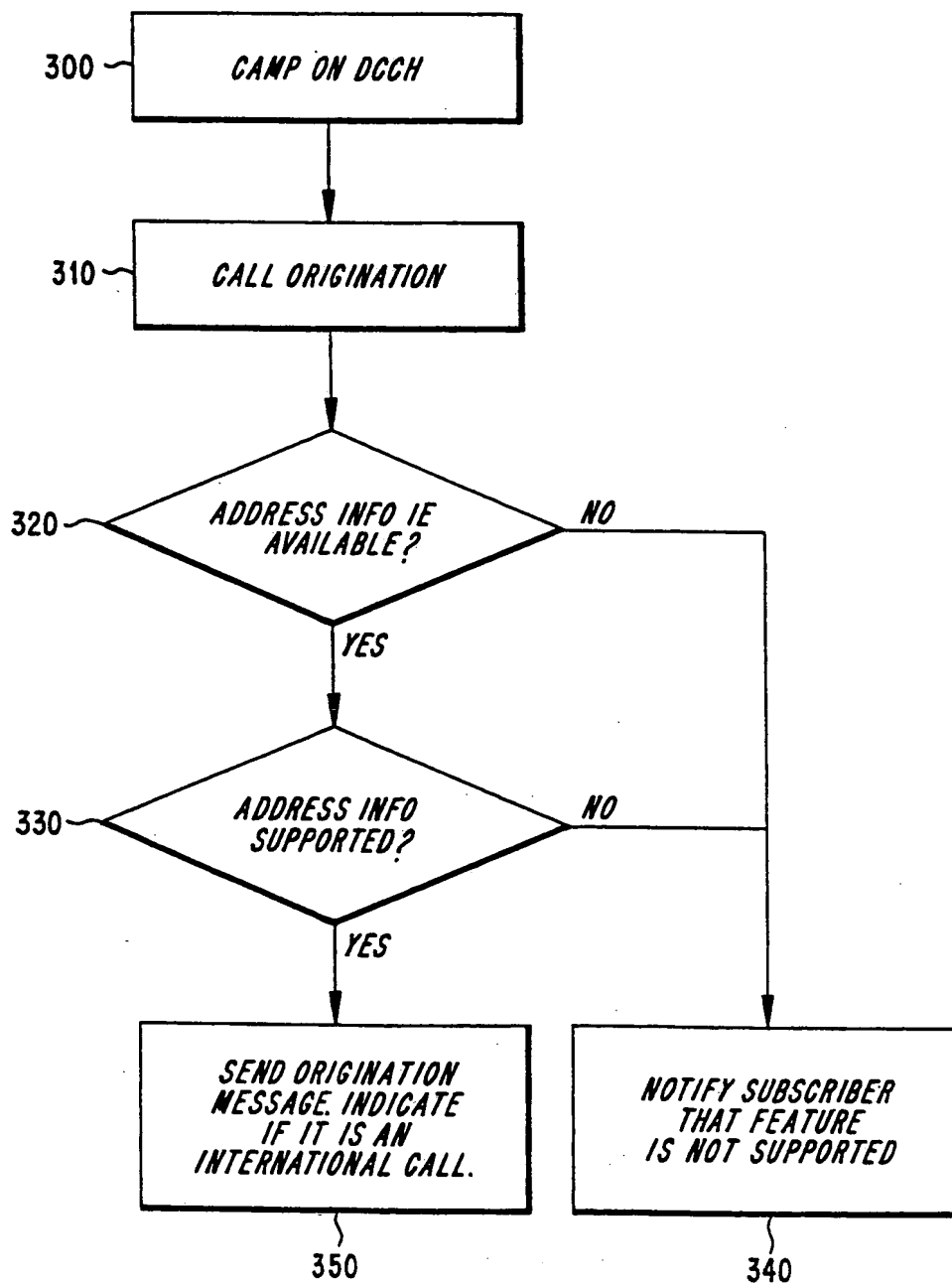
INFORMATION ELEMENT (IE)	PV	TYPE	LENGTH
PROTOCOL DISCRIMINATOR		M	2
MESSAGE TYPE		M	6
VOICE PRIVACY MODE MAP		M	4
DATA PRIVACY MODE MAP		M	4
VOICE CODER MAP		M	6
MESSAGE ENCRYPTION ALGORITHM MAP		M	8-40
MESSAGE ENCRYPTION KEY MAP		M	4
MENU MAP		M	10
FACCH/SACCH ARQ MAP		M	1
USER GROUP MAP		M	1
SMS MAP		M	2
IRA SUPPORT		M	1
OATS SUPPORT	TIA/EIA 136-0, PV0	M	1
ISO-8859-1 (LATIN 1) SUPPORT	TIA/EIA 136-A, PV1	M	1
ISO-10646 (BMP) SUPPORT	TIA/EIA 136-A, PV1	M	1
ISO-8859-8 (LATIN/HEBREW) SUPPORT	TIA/EIA 136-A, PV1	M	1
ASYNC DATA SUPPORT	TIA/EIA 136-A, PV1	M	1
G3-FAX SUPPORT	TIA/EIA 136-A, PV1	M	1
DADS SUPPORT	TIA/EIA 136-A, PV1	M	1
SMS BROADCAST SUPPORT	TIA/EIA 136-A, PV2	M	1
ADDRESS INFORMATION MAP	TIA/EIA 136-A, PV2	M	10

FIG. 2

<i>VALUE</i>	<i>FUNCTION</i>
<i>00000 00000</i>	<i>NO ADDRESS INFORMATION SUPPORTED</i>
<i>XXXXXX XXXX1</i>	<i>UNKNOWN</i>
<i>XXXXXX XXX1X</i>	<i>INTERNATIONAL ACCESS CODE</i>
<i>XXXXXX XX1XX</i>	<i>NATIONAL NUMBER</i>
<i>XXXXXX X1XXX</i>	<i>NETWORK CODE</i>
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FIG. 3



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 613 213 A (GRUBE GARY W ET AL) 18 March 1997 (1997-03-18) column 1, line 65 -column 2, line 64	1,6,12
A	EP 0 877 531 A (NOKIA MOBILE PHONES LTD) 11 November 1998 (1998-11-11) page 3, line 15 - line 33	1,6,12

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US 5613213	A	18-03-1997	NONE	
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			WO 9851100 A	12-11-1998

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